

## Science Lesson Plan:

# Mats@Home: A Microbial Mat Safari

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## Background

Microorganisms in nature often live in a thin film called a microbial mat. Some of these mats are made of microbes that have been on Earth for billions of years. Scientists can learn about what life may have been like on early Earth by studying these mats. Astrobiologists study these mats because they believe that the conditions on Earth 3 to 4 billion years ago may be similar to conditions on other planets or moons in the universe. Although many of the ancient mats have disappeared as a result of predators such as worms or fish feeding on them, we can find microbial mats today in many interesting places.



*Many familiar environments host modern examples of earth's Earliest Ecosystems.*

## Main Concepts

The purpose of this lesson is for students to understand:

1. Microbes are ubiquitous.
2. Microbes often create their own ecosystem called a microbial mat.
3. The mats we see today are similar to the mats that astrobiologists study to learn about early Earth life and the possibility of life on other planets.

## Scientific Questions

Where are microbial mats found in our neighborhoods? What kinds of conditions are necessary for the formation of these microbial mats?

## Objectives

Students will find microbial mats, analogues of some of the earliest ecosystems known to us, growing near their homes and school. Students will be asked to take photographs of the mats to send to NASA. Researchers at NASA will look at the photographs and make their best guess as to what kinds of microorganisms are in the mats, and may ask for samples.

## Abstract of Lesson

Students will find microbial mats, analogues of some of the earliest ecosystems known to us, growing near their homes and school. Students will be asked to take photographs of the mats to send to NASA. Researchers at NASA will look at the photographs and make their best guess as to what kinds of microorganisms are in the mats, and may ask for samples.

## Prerequisite Concepts

This activity is primarily a collecting exercise. If students get the chance to look at the mats under the microscope, students should have general familiarity with laboratory work.

## Major Concepts

1. Microbial mats are complicated microbial ecosystems that occur in a variety of common environments.
2. Microbial mats need water, and light.

## Standards Met:

National Science Education Standards

Life Science Standard:

C-2 The Cell

C-17 Interdependence of organisms

C-21 Matter, Energy and Organization in Living Things

Project 2061 Standards: The Living Environment:

5.D.1 Interdependence of Life

## Materials List:

Required:

1. A plastic spoon, knife or spatula to scrape mat off various substrates without harming the substrate
2. A ruler ( metric, measures in mm)
3. A microbial mat (the object of your search)

Optional:

1. Microscopes (dissecting microscopes will also work)
2. Slides, cover slips, water dropper
3. Plastic straw (for removing a column of microbial mat for microscope)

## Lab and Field Safety

Microbes and microbial mat communities consist of a combination of harmless bacteria and algae. However, when sampling microbial mats from the outdoor environment, you should always consider the possibility that non-point source pollution could occur in that area. Students should always wash their hands after handling microbial mats or “mud”. If you should get the chance to look at the mats under the microscope in the lab, general lab rules apply, and need to be followed. Never eat during the lab. Goggles should also be worn during any lab work.

## Procedure

This lesson plan supplements online instructions that can be found at the Microbes@NASA web site, at: <http://microbes.arc.nasa.gov/learn/mats@home.html>.

The web site instructions are as follows:

## Mats@Home Challenge: Microbial Mat Safari

Microbial mats grow in many environments around your homes and school. They are probably living right under your nose: in your yard, a neighborhood park, or on school grounds! NASA scientists are interested in the samples in your communities. With your parent's permission, and with the help of your teacher, see if you can find and photograph a microbial mat near you. Remember, never go into any place you are not supposed to be, or without permission, and don't go into any environments that are dangerous. There are plenty of mats living in safe places. Your challenge is to find a microbial mat and to take a digital photo of it and/or make a detailed, color sketch along with a list of observations. It is always good scientific practice to include a ruler in the photograph as a "scale bar" so that you can tell just from the photograph how large things are.

Email [nasa-explorer-schools@mail.nasa.gov](mailto:nasa-explorer-schools@mail.nasa.gov) your photo or scan of your sketch with the Subject: Microbial Mat Safari and include the following information:

- Your name
- Your grade
- Your school and school address
- Your teacher's name
- A description of exactly where you found your microbial mat.
- A list of observations such as color, texture, odor, thickness, and size. (Take a ruler!)
- Why you think the mat is growing where you found it: what resources might the microbes be using to make a mat?

**Teachers:** The following two pages can be copied and passed out to students to aid them in their search for microbial mats near their school and home.

# Mats@Home Data Sheet

Name\_\_\_\_\_ Period\_\_\_\_\_

Look around your home inside and out to locate at least 2 places where microbial mats are growing. Using a digital camera, take photographs of the mats to send back to NASA. Here are some questions to answer and send in with your photos:

Location: Where exactly did you find your mat? Describe the location so another person could find it.

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Describe the mat: Make a list of observations such as color, texture, odor, thickness, and size. (Take a ruler!)

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Draw and color a picture of your mat in the space below. Take a picture of the mat if you have a digital camera and attach it. Remember, it is always good scientific practice to include a ruler in the photograph as a “scale bar” so that you can tell just from the photograph how large things are.

Why do you think the mat is growing where you found it? What resources are the microbes using to make a mat?

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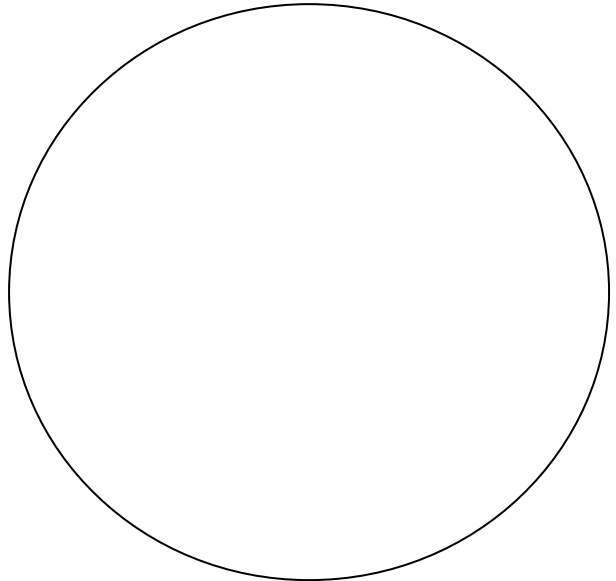
# Mats@Home: Optional Microscope Investigation

Name \_\_\_\_\_ Period \_\_\_\_\_

If you or your teacher has the capability to examine the mat under a microscope, here are some more steps you can take. Scrape off a small piece of mat and put it in a small baggy. Bring the sample to school and we will look at it under the microscope.

## Microbial Mats under the Microscope

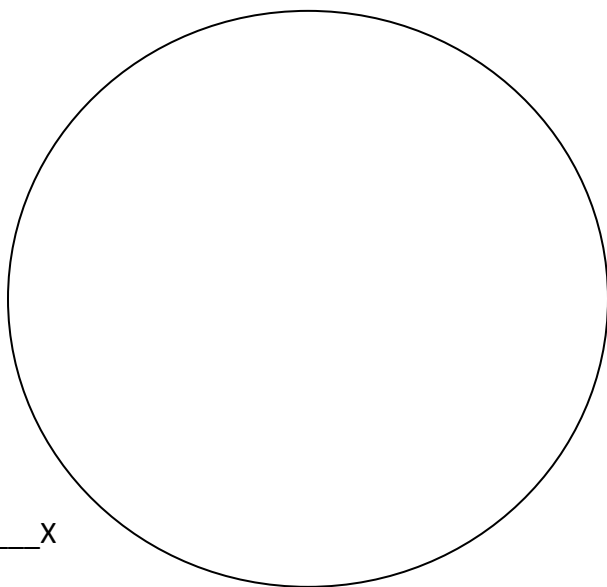
Look at the sample in the baggy under the dissecting microscope.  
Draw and color what you see.



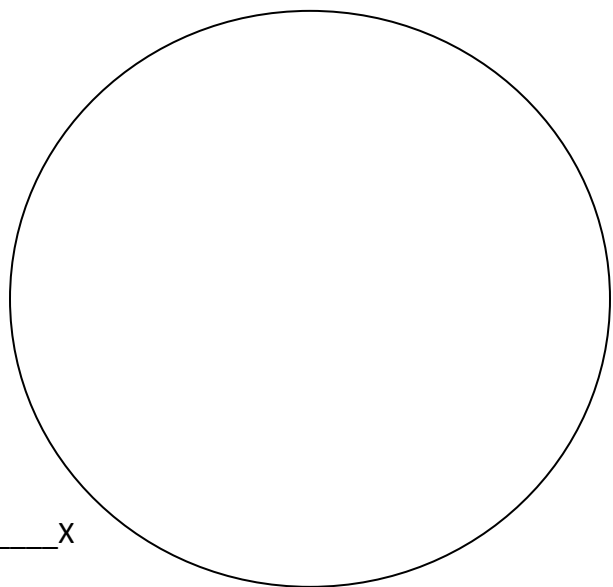
Magnification: \_\_\_\_\_X

Place 1-2 drops of water on a slide, put a small piece of your sample on the slide and place a cover slip on top.

Look at your sample with the compound microscope under low and medium power.  
Draw and color what you see.



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